Migration between Different Types of Urban Areas and Urban Unemployment [1)]

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Summary

Some developing countries show significant urban-urban migration alongside the traditionally dominant pattern of rural-urban migration. On the other hand, urban unemployment is a serious problem, and the urban share is expanding in many developing countries. Therefore, in order to examine the interaction between urban areas and urban unemployment, this study develops a model that incorporates migration between different types of urban areas into a conventional theoretical model of rural-urban migration and urban unemployment. This study shows that a tariff or subsidy policy may increase the level of unemployment in one urban area but necessarily decreases it in the other urban area.

Keywords: Urban-urban migration; two types of urban areas; urban unemployment; Harris-Todaro model

1. Introduction

Workers in many developing countries seek better income and migrate from rural to urban areas. However, they are at risk of unemployment in urban areas. Rural-urban migration, which is the traditional pattern of migration, is a factor of urbanization. Urbanization is an ongoing trend, especially in developing countries. In Asia, which includes many developing countries like India, Pakistan, Bangladesh, and Cambodia, for example, urban share in total population was 31.5% in 1990 and it is predicted to be 52.9% in 2030 (United Nations Human Settlements Programme (UN-HABITAT), 2010,

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1) The author thanks the anonymous referee for the constructive comments and is grateful to Makoto Tawada and Takafumi Matsuba as well for their helpful comments on an earlier version of this paper.

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p. 34)[3].

Due to increasing urbanization, the number of workers in urban areas who migrate to other urban areas in search of better jobs will increase. Weak connection to rural areas owing to long-term stay in urban areas and development of infrastructure such as roads and railroads are likely to increase opportunities for urban-urban migration. Several studies indicate that urban-urban migration is as significant as rural-urban migration. In Pakistan, for example, among migrants with economic motives for migration, the proportion of urban-urban migration is the second (38.7%) highest form of migration, slightly less than rural-urban migration (41.1%) (Khan and Shehnaz, 2000, p. 706)[4].

Harris and Todaro (1970) is notable study regarding theoretical analysis of rural-urban migration and urban unemployment in developing countries. The feature of their model is that urban unemployment emerges even in equilibrium. This is because, in equilibrium, the urban wage rate is fixed at a level higher than the rural wage rate, and the rural wage rate equals the urban expected wage rate. Harris and Todaro (1970) used a closed economy model. Corden and Findlay (1975), Neary (1981), Batra and Naqvi (1987), and others have discussed various aspects of the Harris-Todaro (HT) model in a small open economy[5]. Among these extensions of the HT model, Neary (1981) shows that the effect of an increase in sector-specific capital on the level of unemployment is likely to be negative unless the unemployment rate is already high. Studies that have used the HT or the HT-type model, including those with a three-sector model, assume only one type of urban area. This is because the previous studies focus on rural-urban migration and do not explicitly examine the interaction among urban areas.

This study also uses a simple HT-type model with sector-specific capital. However, this study extends the HT model and assumes that there are two types of urban areas and one rural area, and that migrants move among these three areas. Therefore, this study is unique in that it incorporates urban-urban migration, which accounts for a sig-

3) See also OECD (2012, p. 51) for the prospect of urban population growth. See OECD (2008, pp. 112, 113) for increase in urban area.

4) Another example is the following. In Colombia, ‘of the total number of migrants to the major cities, 75% arrived from an urban context; of these, 46.3% came from cities in other subregions’ (Shefer and Steinvortz, 1993, p. 145). See also Frayne and Pendleton (2001) and Arif (2005).

5) For studies that use a three-sector HT-type model, see Chao and Yu (1993), Gu and Yabuuchi (2003), and Chaudhuri and Yabuuchi (2010), for instance.

nificant part of migration in recent times, explicitly into the conventional HT model. Hence, in such a model, analysis that focuses on the interaction between urban areas can be done, which is not the case with previous studies.

This study examines the effects of tariff, subsidy, and increase in fixed wage rate on the level of unemployment. Although tariffs are a widely used policy tool, especially in developing countries, empirical studies reveal that their effect on unemployment rate is not uniform across countries[6]. Subsidies are used in some developing as well as developed countries. In Papua New Guinea, for example, there is a five-year wage subsidy policy for the production of new manufactured products (PNG Internal Revenue Commission, 2013, p. 7)[7]. Although tariffs and subsidies are carried out through national policy, their effects can be different across regions because industries are not located evenly within a country. This study focuses on this aspect.

The effect of a change in wage rate is analyzed because minimum wage is rising in many countries, such as Vietnam, Indonesia, and Thailand. In most countries, the level of minimum wage is set for each region. In the case of Indonesia, for instance, the minimum wage setting is decentralized to the province level (Comola and Mello, 2011). Thus, the level and the rate of the increase in the minimum wage are not uniform within a country[8]. Therefore, the purpose of this study is to investigate theoretically the effect of these policies on unemployment in a model that incorporates urban-urban migration.

This study finds that while tariff or subsidy may increase the level of unemployment in one urban area, they inevitably decrease the level of unemployment in another urban

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6) For instance, Fugazza et al. (2014) assess the relationship between trade liberalization and unemployment rate using panel data on 97 countries and indicate that trade liberalization causes higher unemployment in Brazil, has no impact on unemployment in India, and reduces unemployment in Algeria. Note that these results are regarding the rate of unemployment. The rate of unemployment and the level of unemployment do not always move in the same direction.

7) Subsidies are also used in developed countries. In France, for example, small and medium-sized companies that hire people under the age of 26, while keeping employees aged 57 or over, win subsidies (OECD, 2013, p. 54). In the United States, to hire workers, various types of subsidy programs for employers exist, both at the federal and the state levels (Neumark, 2013). Schünemann et al. (2013) evaluate a wage subsidy program in Germany and demonstrate that subsidy eligibility has no impact on employment rates.

8) Empirical studies indicate that changes in the minimum wage have varying effects on the labor market. Comola and Mello (2011) find that an increase in the minimum wage is associated with an increase in employment. The opposite empirical results are also obtained for different countries (e.g., Akpansung 2014).

area. These findings are in contrast with that in the standard HT model, that is, the effect on the level of unemployment is indeterminate[9]. Moreover, this study shows that an increase in the fixed wage rate in one type of urban area does not simultaneously decrease the level of unemployment in both urban areas.

2. The model

Consider a small open economy that consists of three sectors: urban sector 1, urban sector 2, and a rural sector. Urban sector 1, urban sector 2, and the rural sector are located in urban area 1, urban area 2, and a rural area, respectively. Each area produces different final goods. For example, motorcycles are produced in urban area 1, clothes are produced in urban area 2, and rice is produced in the rural area. Let the economy export good produced in the rural area (good 3) in exchange for goods produced in urban area 1 (good 1) and urban area 2 (good 2)[10]. The prices of final goods are exogenously given. Two factors, labor and sector-specific capital, are used for production in each area.

Let the subscripts and superscripts 1, 2, and 3 stand for urban area 1, urban area 2, and the rural area, respectively. The production function of each area is described as

$$X_1 = F^1(L_1,\ K_1), \tag{1}$$

$$X_2 = F^2(L_2,\ K_2), \tag{2}$$

$$X_3 = F^3(L_3,\ K_3), \tag{3}$$

where X_i, L_i, and K_i are the output, employed labor, and endowment of sector-specific capital ($i = 1,\ 2,\ 3$), respectively. K_1 represents a machine that makes motorcycle frames, K_2 represents a sewing machine or cloth-cutting machine, and K_3 denotes a plow or thresher, for example. F^i ($i = 1,\ 2,\ 3$) is assumed to be strictly quasi-concave and linearly homogenous, and there is positive and diminishing marginal productivity to each input.

Although capital is fully utilized, labor is fully employed only in the rural area. This study assumes that urban area 1 and urban area 2 are geographically remote, and that there is unemployment in both types of urban areas. Denoting the total endowment of labor, exogenously given by L, the employment condition in the labor market is written as

9) In this study, the standard HT model means a two-sector HT model with sector-specific capital.

10) Good 2 can be an export good. In the real world, countries such as Cambodia and India export clothes.

$$L_1+L_2+L_3+U_1+U_2 = L, \tag{4}$$

where, U_i $(i=1, 2)$ is the level of unemployment in urban area i.

The feature of the HT model is that the urban wage rate is fixed at a level higher than the flexible rural wage rate, and that the urban expected wage rate equals the rural wage rate at labor market equilibrium. This study uses the same assumptions. Previous studies using the HT model had one urban area; however, this study considers two types of urban areas and labor is assumed to migrate between three types of areas until the rural wage rate equals the expected wage rates in the urban areas. Thus, the arbitrage condition for labor is expressed as

$$w = \bar{w}_1 L_1/(L_1+U_1) = \bar{w}_2 L_2/(L_2+U_2), \tag{5}$$

where w is the perfectly flexible rural wage rate and $\bar{w}_i$ $(i=1, 2)$ is the rigid wage rate in urban areas. Note that $\bar{w}_1$ and $\bar{w}_2$ can take different levels.

Let good 3 be the numéraire, and p_i $(i=1, 2)$ be the domestic producer price of good i. Profit maximization of each area yields:

$$p_1 F_L^1(L_1, K_1) = \bar{w}_1, \tag{6}$$

$$p_2 F_L^2(L_2, K_2) = \bar{w}_2, \tag{7}$$

$$F_L^3(L_3, K_3) = w, \tag{8}$$

where $F_L^i \equiv \partial F^i/\partial L_i$ $(i=1, 2, 3)$.

This completes the description of the model. Nine equations (1)-(8) determine the nine endogenous variables, X_1, X_2, X_3, L_1, L_2, L_3, U_1, U_2, and w.

3. Comparative static analysis

Let us now consider how a capital increase, tariff, subsidy, and a rise in wage rate affect the level of unemployment in each urban area[11]. Totally differentiating equations (4)-(8), and arranging the terms, we have

$$\begin{bmatrix} 1 & 1 & 1 \\ F_{LL}^3 & A & 0 \\ F_{LL}^3 & 0 & B \end{bmatrix} \begin{bmatrix} dL_3 \\ dU_1 \\ dU_2 \end{bmatrix} = \frac{F_{LK}^1}{F_{LL}^1} \begin{bmatrix} 1 \\ -\dfrac{AU_1}{L_1} \\ 0 \end{bmatrix} dK_1 + \frac{F_L^1}{p_1 F_{LL}^1} \begin{bmatrix} 1 \\ -\dfrac{AU_1}{L_1} \\ 0 \end{bmatrix} dp_1 + \begin{bmatrix} -\dfrac{1}{p_1 F_{LL}^1} \\ \dfrac{AU_1}{p_1 F_{LL}^1 L_1} + \dfrac{L_1}{L_1+U_1} \\ 0 \end{bmatrix} d\bar{w}_1, \tag{9}$$

where, $A = w/(L_1+U_1) > 0$, $B = w/(L_2+U_2) > 0$, and $F_{LL}^1 = \partial F_L^1/\partial L_1$, and so on (see Ap-

11) Alternatively, the effects of changes in exogenous variables in urban area 2 can be analyzed.

pendix).

3.1. Capital increase in one type of urban area

First, let us examine the effect of a capital increase in urban area 1[12]. The motivation for analyzing the effect of capital increase is to establish a benchmark to see how unemployment in each area is affected when a policy that induces employment increase in one urban area is implemented. Solving equation (9) with respect to dK_1, the following is obtained:

$$dL_3/dK_1 = ABF^1_{LK}(U_1/L_1+1)/F^1_{LL}\Delta < 0, \tag{10a}$$

$$dU_1/dK_1 = AF^1_{LK}\{-BU_1/L_1+F^3_{LL}[U_1/L_1-(L_1+U_1)/(L_2+U_2)]\}/F^1_{LL}\Delta, \tag{10b}$$

$$dU_2/dK_1 = -AF^1_{LK}F^3_{LL}(U_1/L_1+1)/F^1_{LL}\Delta < 0, \tag{10c}$$

where $\Delta = AB-F^3_{LL}(A+B) > 0$ is the determinant of the coefficient matrix of equation (9)[13].

In equation (10b), the square brackets can take any sign. If the absolute value of the partial derivative of the marginal product of labor with respect to the labor input in the rural area (F^3_{LL}) is sufficiently small, the effect of the second term in the curly brackets is diminished and the sign of equation (10b) becomes positive[14]. The major results are summarized in the following proposition:

Proposition 1. *A capital increase in urban area 1 (i) increases the level of unemployment in urban area 1 if the absolute value of the partial derivative of the marginal product of labor with respect to the labor input in the rural area (F^3_{LL}) is sufficiently small and (ii) necessarily decreases the level of unemployment in urban area 2.*

The intuitive explanation of Proposition 1 is as follows. From equation (6), K_1/L_1 is constant. Thus, with an increase in K_1, L_1 increases, which in turn decreases L_3. A decrease

12) The effects of an increase in K_3 and L have also been examined. In both of the above cases, the changes in unemployment are similar among two urban areas. Moreover, the result is similar to the result obtained in the standard HT model.

13) Note that in this study, the effect of an increase in K_1 on the level of total unemployment (U_1+U_2) is indeterminate. This result is similar to the result that is obtained in the standard HT model. See, for example, Neary (1981).

14) We thank the editor for pointing this out. Alternatively, if we assume that $U_1/L_1-(L_1+U_1)/(L_2+U_2) > 0$, the sign of (10b) also becomes positive. It is shown that this assumption holds when the rural capital (K_3) is small, for example.

in L_3 raises w from equation (8), because K_3 is constant. When w rises, the expected wage rates in the urban areas also rise from equation (5)[15].

First, we explain (i) in Proposition 1. If the absolute value of F^3_{LL} is small, an increase in w is small. Thus, from equation (5), an increase in the expected wage rate in urban area 1 must also be small. An increase in L_1 increases the expected wage rate in urban area 1. This effect, however, has to be weakened by an increase in U_1 for the increase in the expected wage rate in urban area 1 to be small. Therefore, (i) in Proposition 1 is obtained. Second, we explain (ii) in Proposition 1. In urban area 2, a rise in the expected wage rate is induced solely by a fall in U_2 because from equation (7), L_2 is constant. Therefore, (ii) in Proposition 1 is obtained.

3.2. Tariff on good produced in one type of urban area

Second, let us consider the effect of a tariff on good 1. Let p_1^* be the exogenously given foreign price of good 1 in terms of good 3. Then, $p_1 = p_1^*(1+t)$ when an *ad valorem* tariff at rate t is imposed on good 1. Differentiating $p_1 = p_1^*(1+t)$ at constant p_1^*, we have $dp_1 = p_1^* dt$. Thus, from equation (9), the following is obtained:

$$dL_3/dt = p_1^* dL_3/dp_1 = p_1^* ABF^1_L(U_1/L_1+1)/p_1 F^1_{LL}\Delta < 0, \qquad (11a)$$

$$dU_1/dt = p_1^* dU_1/dp_1 = p_1^* AF^1_L\left[-\frac{BU_1}{L_1}+F^3_{LL}\left(\frac{U_1}{L_1}-\frac{L_1+U_1}{L_2+U_2}\right)\right]/p_1 F^1_{LL}\Delta, \qquad (11b)$$

$$dU_2/dt = p_1^* dU_2/dp_1 = -p_1^* AF^1_L F^3_{LL}(U_1/L_1+1)/p_1 F^1_{LL}\Delta < 0. \qquad (11c)$$

Hence, the following proposition is obtained:

Proposition 2. *A tariff on good 1 (i) increases the level of unemployment in urban area 1 if the absolute value of the partial derivative of the marginal product of labor with respect to the labor input in the rural area (F^3_{LL}) is sufficiently small and (ii) necessarily decreases the level of unemployment in urban area 2.*

A tariff on good 1 increases p_1, which in turn increases L_1 from equation (6). Therefore, a similar explanation to that immediately following Proposition 1 is given for Proposition 2.

3.3. Subsidy for good produced in one type of urban area

Third, let us consider the effects of subsidies. The subsidy is supposed to be financed

15) Which means that unemployed to employed rate falls in both urban areas.

by a lump sum tax.

First, we consider the effect of a production subsidy. Assuming that ep_1^* is provided per unit of production of good 1, and remembering that p_1 is producer price, $p_1 = p_1^*(1+e)$ holds. Differentiating $p_1 = p_1^*(1+e)$ at constant p_1^*, we have $dp_1 = p_1^* de$. Thus, dL_3/de, dU_1/de, and dU_2/de are expressed as equations (11a), (11b), and (11c), respectively. Hence, the following proposition can be made:

Proposition 3. *A production subsidy for good 1 (i) increases the level of unemployment in urban area 1 if the absolute value of the partial derivative of the marginal product of labor with respect to the labor input in the rural area (F_{LL}^3) is sufficiently small and (ii) necessarily decreases the level of unemployment in urban area 2.*

Provision of the production subsidy increases p_1. Therefore, similar results to Proposition 2 are obtained.

Next, we consider the effect of a wage subsidy. It is assumed that $s\bar{w}_1$ is provided to firms in urban area 1 per unit of employed labor. Then, equation (6) is replaced by

$$p_1 F_L^1(L_1, K_1) = (1-s)\bar{w}_1. \tag{6'}$$

Therefore, from equations (4), (5), (6′), (7), and (8), we have

$$\begin{bmatrix} 1 & 1 & 1 \\ F_{LL}^3 & A & 0 \\ F_{LL}^3 & 0 & B \end{bmatrix} \begin{bmatrix} dL_3 \\ dU_1 \\ dU_2 \end{bmatrix} = \frac{\bar{w}_1}{p_1 F_{LL}^1} \begin{bmatrix} 1 \\ -\dfrac{AU_1}{L_1} \\ 0 \end{bmatrix} ds. \tag{9'}$$

Solving equation (9′), it can be shown that the effects of the wage subsidy are similar to those of the production subsidy. Therefore, the following corollary of Proposition 3 is obtained:

Corollary. *A wage subsidy for good 1 (i) increases the level of unemployment in urban area 1 if the absolute value of the partial derivative of the marginal product of labor with respect to the labor input in the rural area (F_{LL}^3) is sufficiently small and (ii) necessarily decreases the level of unemployment in urban area 2.*

Propositions 1-3 and the Corollary show that a capital increase, tariff, or subsidy in urban area 1 has a similar effect. This is because L_1 increases from equation (6) in each case.

3.4. Rise in fixed wage rate in one type of urban area

Finally, let us consider the effect of a rise in the fixed wage rate in urban area 1. From equation (9), the following is obtained:

$$dL_3/d\bar{w}_1 = -B[A(U_1/L_1+1)/p_1F_{LL}^1+L_1/(L_1+U_1)]/\Delta, \quad (12a)$$

$$dU_1/d\bar{w}_1 = \left\{A\left[\frac{BU_1}{L_1}-F_{LL}^3\left(\frac{U_1}{L_1}-\frac{L_1+U_1}{L_2+U_2}\right)\right]/p_1F_{LL}^1+\frac{L_1(B-F_{LL}^3)}{L_1+U_1}\right\}/\Delta, \quad (12b)$$

$$dU_2/d\bar{w}_1 = F_{LL}^3[A(U_1/L_1+1)/p_1F_{LL}^1+L_1/(L_1+U_1)]/\Delta. \quad (12c)$$

Although the signs of equations (12a)-(12c) are conditional, the following is stated.

First, suppose that a rise in $\bar{w}_1$ decreases U_1; then, U_2 necessarily increases. This is because from equation (6), a rise in $\bar{w}_1$ decreases L_1. From equation (7), L_2 is constant. Noting that from the second equation in equation (A8), U_2 and L_3 change in the same direction, U_2 necessarily increases from equation (4). In this case, labor migrates from urban area 1 to other areas.

Next, suppose that a rise in $\bar{w}_1$ decreases U_2; then, U_1 inevitably increases. This is because when U_2 decreases, L_3 also decreases from the second equation in equation (A8). Therefore, noting that L_1 decreases and L_2 is constant, U_1 inevitably increases form equation (4). In this case, labor migrates to urban area 1 from other areas. Thus, the following proposition is obtained:

Proposition 4. *Suppose that the fixed wage rate in urban area 1 rises. If the level of unemployment in urban area 1 (2) decreases, the level of unemployment in urban area 2 (1) necessarily increases.*

In Proposition 4, the level of unemployment in one type of urban area is assumed to decrease. The following explains in what situation the level of unemployment in one type of urban area decreases. Here, we explain the case where U_2 decreases. The expected wage rate in urban area 1 increases by the direct effect of the increase in $\bar{w}_1$. When the expected wage rate in urban area 1 increases, the expected wage rate in urban area 2 also increases from equation (5). Because L_2 is constant, a rise in the expected wage rate in urban area 2 is caused solely by a decrease in U_2. Thus, if the direct effect of an increase in $\bar{w}_1$ on the expected wage rate in urban area 1 (i.e., the second term in square brackets in equation (12c)) is sufficiently large, U_2 decreases.

4. Concluding remarks

This study has analyzed the interaction between urban areas in an HT-type model that comprises two types of urban areas. This study shows that a policy that leads to an increase in employment in one type of urban area may not be effective in reducing the level of unemployment in that area, whereas it unambiguously decreases the level of unemployment in another type of urban area. Such unequal effects between urban areas have not been the focus in the previous studies that have used the HT model. The findings of this study indicate the importance of considering the interaction between urban areas towards policymaking.

The intuitive explanations of the results of this study are as follows. A policy that leads to an increase in employment in one type of urban area attracts labor from the rural area. Moreover, the key characteristic of this study is that labor is also attracted from the unemployment pool in another type of urban area, thus causing the decrease in unemployment in that area. In the urban area where labor flows in, if the inflow of migrants outweighs the increase in employment, unemployment increases.

In the case of multiple urban areas, which is not examined in this study, a similar result would be obtained: a policy that leads to an increase in one type of urban area may increase unemployment in that area, whereas it necessarily decreases unemployment in the other urban areas. If capital is assumed to be mobile, the system is overdetermined[16]. It should also be noted that if the goods produced in two urban areas are identical, the same results as those in this study are obtained for some cases.

Appendix: Derivation of equation (9)

Totally differentiating equations (4)-(8), we have

$$dL_1 + dL_2 + dL_3 + dU_1 + dU_2 = 0, \tag{A1}$$

$$dw = (AU_1/L_1)dL_1 - AdU_1 + [L_1/(L_1+U_1)]d\bar{w}_1 = (BU_2/L_2)dL_2 - BdU_2, \tag{A2}$$

$$p_1(F_{LL}^1 dL_1 + F_{LK}^1 dK_1) + F_L^1 dp_1 = d\bar{w}_1, \tag{A3}$$

$$p_2 F_{LL}^2 dL_2 = 0, \tag{A4}$$

$$F_{LL}^3 dL_3 = dw. \tag{A5}$$

Using equations (A2) and (A5) to eliminate dw, we have

16) If capital is mobile between sectors, then $p_1 F_K^1(K_1/L_1) = p_2 F_K^2(K_2/L_2)$. However, this condition does not always hold under K_i/L_i $(i=1, 2)$, determined by (6) and (7).

$$(AU_1/L_1)dL_1 - AdU_1 + [L_1/(L_1+U_1)]d\bar{w}_1 = (BU_2/L_2)dL_2 - BdU_2 = F^3_{LL}dL_3. \tag{A6}$$

From equations (A3) and (A4), we obtain $dL_1 = -\frac{1}{F^1_{LL}}[F^1_{LK}dK_1 + (F^1_L/p_1)dp_1 - (1/p_1)d\bar{w}_1]$ and $dL_2 = 0$, respectively. Substituting these two equations into equations (A1) and (A6), we have

$$-(1/F^1_{LL})[F^1_{LK}dK_1 + (F^1_L/p_1)dp_1 - (1/p_1)d\bar{w}_1] + dL_3 + dU_1 + dU_2 = 0, \tag{A7}$$

$$-\frac{AU_1}{L_1F^1_{LL}}\left(F^1_{LK}dK_1 + \frac{F^1_L}{p_1}dp_1 - \frac{1}{p_1}d\bar{w}_1\right) - AdU_1 + \frac{L_1}{L_1+U_1}d\bar{w}_1 = -BdU_2 = F^3_{LL}dL_3. \tag{A8}$$

Equations (A7) and (A8) can be written in matrix form as equation (9) of the text.

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